AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 11

THE BLACKBURN "SPRAT"

A Training Airplane Convertible into Landplane or Seaplane

From "Flight," May 27, 1926

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THE BLACKBURN "SPRAT"*

A Training Airplane Convertible into Landplane or Seaplane.

In external appearance, no less than in detail construction, the Blackburn "Sprat" bears a very strong "family resemblance" to the famous Blackburn "Swift" and "Dart" airplanes, which are already familiar to our readers. The "Sprat" has, however, been designed for use as a training airplane, and consequently, a power unit of considerably lower power is fitted. The engine fitted as standard is the Rolls-Royce "Falcon" of 275 HP., although the makers point out that if desired, the airplane can easily be adapted for other engines of approximately the same power. As illustrated in the accompanying figures, the "Sprat" is shown with the "Falcon" engine.

In general design the Blackburn "Sprat" is of the normal biplane type, with top and bottom wings of equal span. A feature of the design is that the airplane can be changed rapidly from a landplane to a seaplane and vice versa, the two types of landing gear being so designed that each is a complete unit in itself, detachable at the fuselage and wing root joints. As a seaplane the "Sprat" is of the twin-float type, the float landing gear being so designed that no cross tubes or struts

* Taken from "Flight," May 27, 1926.

are required. As a landplane, the "Sprat" has a landing gear similar in design to that of the well-known "Swift." In Fig. 1 the airplane is shown with the land landing gear drawn in full lines and the float landing gear in dotted lines.

Controllability in the air and on the water, low landing speed, good view from both cockpits, and economy in operation and maintenance were the objects in the design of the Blackburn "Sprat." Concerning the maneuverability and general behavior on the water, the form and dimensions of the floats are based upon those fitted to the Blackburn "Dart," which has been in use for a long time at the Blackburn training school at Brough. These floats have been tested in the tank in model form, and it was found that they ran very cleanly, had no tendency to "porpoising," and led to stable conditions when trimmed to take off. Full scale tests have confirmed these results. The "Dart" seaplane takes off with the pilot's hands off all controls. In order to facilitate maneuvering at low speeds, the floats are fitted with water rudders. While on the subject of floats, it should be pointed out that the "Sprat" can be supplied with either wood floats or all-duralumin floats. Fig. 3 shows the metal floats, with some of their constructional details. It will be seen that the floats are of the vee-bottom rounded deck type with single steps, and the keelson extends from the keel to the deck, the landing gear struts being attached to the keelson and bedding down to the keel. These sketches also indicate

the attachments on the floats for wheeled trestles used in changing one type of landing gear for the other, and as there are no cross tubes or axles in either landing gear, each half of either can be detached or attached independently of the other half, which naturally facilitates the operation.

Constructionally the "Sprat" follows the "Swift" and "Dart" types, the fuselage being built up in such a manner that components are grouped in units easy of access and removal with a minimum of disturbance of the main structure. There are three such units, the engine unit, the central unit or backbone (which is built entirely of steel tubing) to which all the main components are attached, and the tail portion, which is of wood construction. The engine unit is quickly detachable by means of four bolts, just forward of the fireproof bulkhead, and is so designed that when disconnected from the fuselage it forms its own engine bed and can be set down on a flat bench or on the floor.

The accommodation for pupil and instructor (the latter occupying the aft cockpit) is such that not only is communication between them made as easy as possible, but both obtain an excellent view, as they are situated aft of the trailing edge of the top wing, which is cut away near the center. In point of fact, the view is equal to that of the "Swift" torpedo carrier, which has proved exceptionally good for deck landing work, where a good view is essential. A neat feature is the placing of the instruments on the rear top spar, where they can be seen by both occupants.

The biplane wings are of normal construction, and are designed to fold, so that in this state the airplane occupies a very small space.

The land landing gear, as already mentioned, is similar to that of the "Swift," and has two independent halves, unconnected by axles. The shock-absorbing gear is in the form of rubber blocks in compression, a form which is becoming increasingly popular, and which has been used by the Blackburn Company for several years. With the sloping center-section struts typical of the torpedo airplane, the landing gear attachments are situated a fair distance out from the center, thus giving a very wide wheel track and making the airplane particularly stable on the ground. Moreover, the absence of any cross-members renders the airplane much less likely to "nose over" if a landing in tall grass or corn should be necessary. In the illustrations the grapples used for deck landing may be seen.

Item Weights

We have been able to obtain from the Blackburn Company a very full schedule of item weights, which should be of interest. The weights are as follows:

Structure	Seaplane lb.	Landplane lb.
Float or land landing gear,	380	130
Fuselage (seats, floors and flotation bags),	290	290
Landing Gear,	80	-
Engine mountings, cowls, etc.,	80	80
Tail skid,	12	12
Flight controls,	65	65
Main wings,	480	480
Tail unit,	70	70
Total structure weight,	1,457(41%)	1,127(35%)

The weight of the power unit is, of course, the same for the seaplane and the landplane, and is made up as follows:

Engine (dry),	725 lb.
Water in engine,	25 "
Radiator and water,	160 "
Propeller,	50 "
Engine accessories and piping,	90 "
Gas starter,	65 "
Total weight of engine unit,	1,115 "

This represents a percentage weight of 31.4 for the seaplane and 34.65 for the landplane.

The items connected with the fuel, tanks, etc., are also identical for both types, and are as follows:

Fuel (56 gallons)	425	lb.
Oil (4 gallons),	40	"
Water (1½ gallons),	15	"
Fuel tanks,	60	"
Oil tank,	10	"
Water tanks,	6	"
Total,	556	"

which represents 15.7% in the case of the seaplane, and 17.25% for the landplane.

The following military load is carried in both types:

Crew, (2),	360	lb.
Instruments,	55	"
Very pistol and 12 cartridges,	7	"
Total,	422	"

or 11.9% of the total loaded weight of the seaplane and 13.1% of the landplane. The total loaded weight of the seaplane is 3,500 lb., and of the landplane 3,220 lb.

Performance

Following are the estimated performances of the airplane in its two forms:

	Seaplane	Landplane
Top speed at sea level,	98 knots	100 knots
Top speed at 5000 ft.,	95 "	100 "
Climb (sea level),	937 ft./min.	1100 ft./min.
Time to 5000 ft.,	6½ min.	5½ min.
Time to 10000 ft.,	16 "	13 "
Service ceiling,	15,700 ft.	17,500 ft.
Landing speed,	40 knots	39 knots

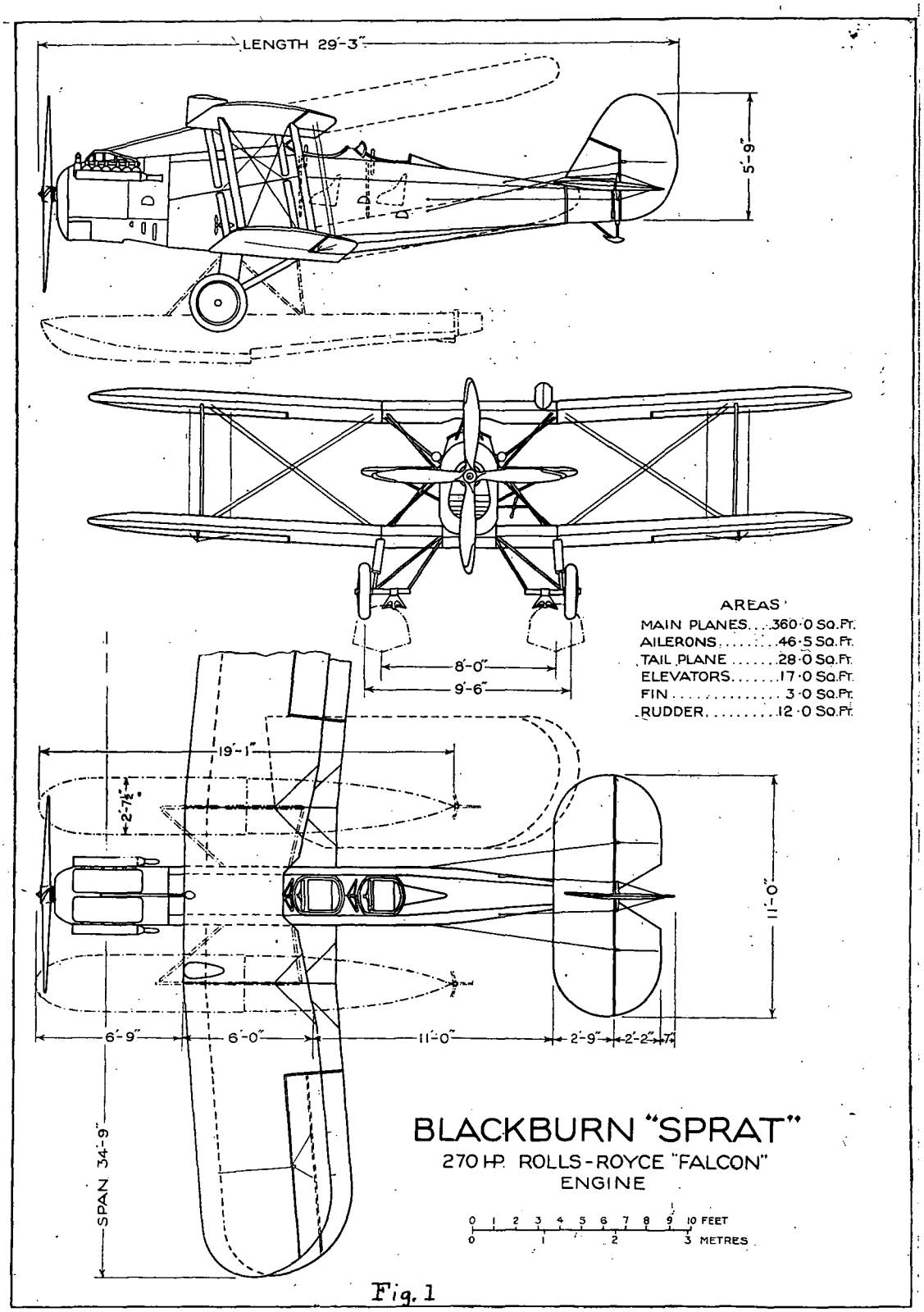

Fig. 1

THE BLACKBURN "SPRAT": A Training Machine convertible into landplane or seaplane. General Arrangement Drawings, to Scale.

2730 A.S.